

## **RANGE**

### **Pre-fire Conditions**

The suitable rangeland on both the Rockerville and Bitter Creek Allotments was slowly moving toward unsatisfactory condition due to the pine encroachment. Ponderosa pine seedlings were encroaching upon meadows and parks. Many young, dense pine stands existed along the ridges and north/east slopes. Timber sale activity was not adequate to maintain openings. Springs and ponds were drying up because of water consumption by increasing numbers of pine trees. The forage trend was moving away from the plant community desired by range management. The visual effect was a solid canopy of pine interspersed with some aspen, oak and rock outcrops.

There are no live streams currently on the allotments within the fire perimeter (with the exception of a small stretch of Battle Creek not used by permitted cattle). Teepee Creek had been modified with low head dams in the 1980's to improve it to a perennial flow. Mudboggers and ATVs reduced it back to intermittent flows in the 1990's.

Maintenance of private land fences has been a continuing problem as ranches and homesteads became subdivided and new homeowners moved in.

### **Post-fire Conditions**

Within the fire, some meadows burned, others did not. Rangeland forage in general within the fire perimeter is reduced to stubble and regrowth. Burned meadows were low to moderate burn intensity except when dense dog hair stands existed. These meadows evolved under fire conditions and the forage plants will re-establish very easily under normal moisture conditions. The allotments are stocked to maintain or improve the range condition. In instances where a downward trend is occurring, management of livestock is being adjusted either through an allotment management plan or the annual operating instructions.

Since most permitted cattle were removed during the fire, there will be no effect from continued grazing on meadows and other rangeland inside the burn this year. The remainder of the cattle were removed after the fire passed. None have been intentionally returned to pastures located inside the burn. Permittees have accounted for all but approximately six head, which they speculate are spread out in the black or have moved to private land due to

destroyed fences and open gates. When those cattle are located and identified, the permittees are asked to remove them immediately.

Continued forage utilization by cattle within the burned area would not be sufficient to provide even a maintenance diet.

Over time the result of this fire will be an increase of forage available to livestock because of the reduction of pine encroachment and timber canopy. Portions of this forage will be transitory in nature. This means that eventually the area will be replaced by pine overstory and lose its forage value to livestock. Also the availability of the forage to livestock is dependent on location of water.

From field observations it is apparent that damage to barbwire fences has occurred. In areas of high fire intensity the wire and all posts are damaged and will need to be replaced. Wooden posts were damaged even in areas of low intensity. Corners and gate braces will need to be replaced. Field observations have shown that green treated posts received the most damage. The metal posts become brittle with heat and will break during stress such as snowfall or high winds.

Field observations have also shown that spring developments received various amounts of damage. Pre-existing exclosures of water sources were destroyed, stock tanks damaged by heat, and posts and barriers around tanks burned up. Damage to pipelines from springs to tanks has occurred due to dozer activity. There is the possibility of dugouts and small dams silting in more rapidly than usual.

Allotments	No. Of Permits Affected	Total No. Permitted Livestock	Total Head Months	HM Lost to fire	Total Acres in Allotment	Acres inside Fire Perimeter by Pasture	Affected Pastures	Grazing System
<b>Bitter Creek</b>	1	50c/c	250	0	12,875	1190 288	Boulder Hill Middle	4-Pasture Deferred
<b>Rockerville</b>	3	89 c/c 10 c/c 12 c/c	556	167 30%	10,944	1787 1500 1208 2919	Foster Upper Deadman Lower Deadman Teepee	4- Pasture Deferred
<b>Rockerville</b>	1	26	130	0	2117	1109	Koopman	Season- long



*Range fence damaged by fire*

**Bitter Creek:** 11% of the allotment was within the fire perimeter. There is approximately five miles of fence affected by the fire within the allotment. There is one damaged water improvement located within the fire perimeter

**Rockerville (north):** 68% of the allotment was within the fire perimeter. The burned area of three pastures was greater than 90%. The allotment's four pastures are under a deferred rotation grazing system. There are 4 damaged water improvements located within the fire perimeter. There are 8.25 miles of fence that have been affected by the fire. This does not include the private land fencing.

## **Recommendations**

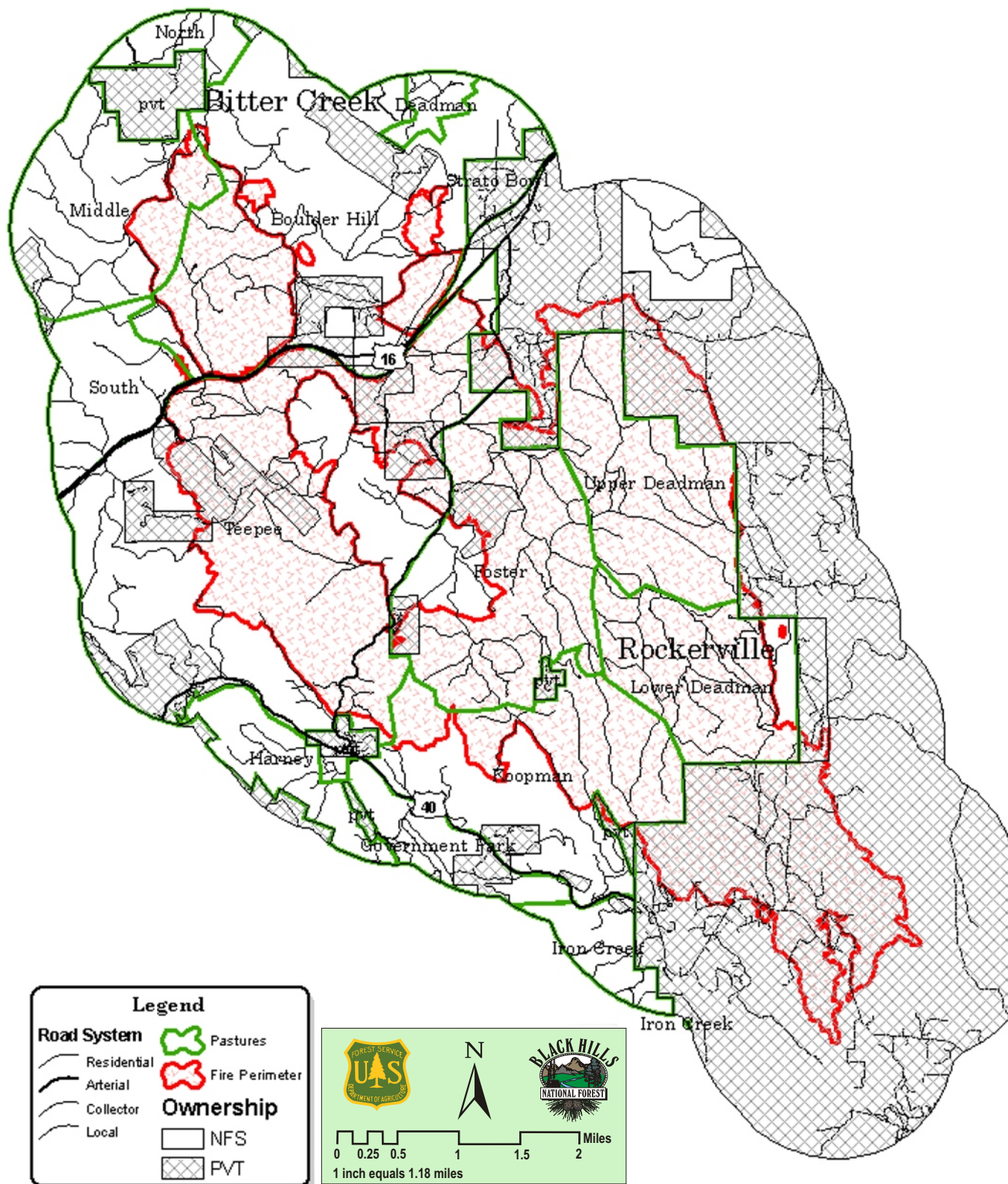
- Reconstruct pre-fire range improvements damaged by the fire or fire suppression . Remove hazardous trees as appropriate where the potential exists to fall on fences.
- New fences may need to be built in areas that were not fenced, but used natural topography or trees (barriers) to deter livestock. Dense stands of timber are now open and may allow the movement of livestock into areas they have not been historically used.
- Rest for Boulder Hill and Middle units of Bitter Creek for one year and then re-evaluate condition and vegetative response. This will take into account hydrology and soil recommendations for ground cover. Reconstruct fences and spring developments.
- Rest Rockerville (north of Highway 40) one year to allow vegetation to become reestablished. Monitor vegetation response, reevaluate for possible entry in 2004. Take that time to reconstruct the fences. Reconstruct the damaged water developments including stock tanks.

## **Monitoring**

This is an excellent opportunity to document post-fire ecosystem changes. With the shortage of personnel and time, permanent photo points are the most efficient type of monitoring. Selection of key areas is the most critical element for this type of monitoring. Photo points should be selected in representative sites in each pasture. The primary method for photo plots should follow the Region 2 Range Analysis guide. Baseline photos should be taken yet this year.



# Battle Creek Range Allotments and Pastures



## **NOXIOUS AND INVASIVE WEEDS**

### **Pre-fire Conditions**

Known noxious weed sites within the fire perimeter are approximately 1,100 acres. National forest system lands and private lands adjacent to the burned areas had established noxious weed populations including, but not limited to: Canada thistle, leafy spurge, houndstongue, yellow toadflax, musk thistle, bull thistle, scotch thistle, whitetop, chicory, St. Johnswort, common tansy, burdock, common mullein, and perennial sow thistle. Treatment within this area has been done on a yearly basis due to the Leafy spurge infestations. County and private lands surrounding and interior of the fire area have established noxious weed populations that have been identified through mapping and coordination with the Pennington County Weed and Pest Supervisor.

Biological control sites were established in two or more areas within the burn area with an Aphthona Flea beetle mix for leafy spurge control. Aggressive biocontrol methods were maintained in this area to help establish insect colonies, thus controlling the spread of leafy spurge.

### **Post-fire Conditions**

The Battle Creek Fire has created a favorable seedbed to establish noxious weed populations, especially in severely burned areas. Noxious weeds will establish quickly in areas that take native vegetation much longer to establish, taking advantage of the resources (soil nutrients, soil moisture) with little competition.

County and private lands surrounding and interior to the fire have already established noxious weed populations that have been identified through mapping and coordination with the Pennington County Weed and Pest Supervisor.

During the suppression efforts, vehicles and heavy equipment moved onto public from the weed infested private and county lands. Many vehicles and heavy equipment from all over the country potentially carried noxious weed seed and increasing the potential for noxious weed infestations by at least 30-40 percent. Dozer lines and hand lines created during the suppression efforts are expected to further increase the potential for noxious and invasive weed infestations. Forest Service roads, county roads and the Flume Trail are expected to continue to contribute to the spread of noxious weeds.

Dozer and hand lines built during the suppression efforts have been recorded with GPS units as well as hand lines to monitor for new weed invasions. Forest Service roads, the Flume Trail and county roads within the fire perimeter have been mapped to facilitate monitoring of their spread into or within the burned areas.

Biological control sites within the fire perimeter were burned over. However, the severity of the damage to flea beetle larva for leafy spurge will not be known until next summer. Grasses are starting to come up, as are leafy spurge.



*Noxious weeds growing after the fire*

In the spring, a check of the root systems for the *Aphthona* larva needs to occur. The biological control measures within the burn cannot be assessed fully until such time, if and when the adult *Aphthona* beetles emerge.

## Recommendations

- National forest system lands need to be treated for noxious and invasive weeds in close coordination with private landowners, due to the amount of traffic and ground disturbance in and out of the fire area. The fire camp (private land) should also be treated.
- Close coordination is needed between the Black Hills NF and Pennington County Weed and Pest Department. In particular, chemical application needs to be a coordinated effort to prevent road rights-of ways from being sprayed by both organizations. Roads going into and out of the fire area need to be treated to help prevent the spread of noxious and invasive weeds.
- Severely burned areas should be seeded with noninvasive annual grasses and perennial native grasses to reduce the potential for noxious and invasive weeds establishment. Weed free seed needs to be checked prior to actual seeding. Seeding has started on dozer and hand lines, and with the proper moisture should help in suppressing weed growth.

- A check of the root systems for the *Aphthona* larva needs to take place. The biological control measures within the burn cannot be assessed fully until late spring if and when the adult *Aphthona* beetles emerge.
- Use integrated weed management practices, in accordance with the Environmental Assessment for the Management of Control of Noxious Plants on the Black Hills NF, to provide timely treatments of noxious and invasive weeds.
- Identify and treat species with the highest potential to cause substantial and persistent long-term degradation of ecosystem function. These species include, but are not limited to: Canada thistle, leafy spurge and common mullein. The time frame should be 3 to 5 years due to the characteristics of the noxious weed base.
- Use weed free mulch and erosion materials.
- Select natives or non-invasive introduced species. Provide for testing of seed to verify the absence of noxious weed seed. Monitor and treat areas within the perimeter of the fire adjacent to known private land weed infestations.
- Provide for the use of an *Aphthona* flea beetle insect mix in the Leafy spurge areas as a means of integrated noxious weed control for 3 to 5 years.
- Provide to Pennington County and the South Dakota Department of Transportation a list of natives and non-invasive seed species for restoration of rights-of-ways and hill sides along all state and county road systems.

## **Evaluation And Monitoring**

- Identify and monitor areas of concentrated human or animal activity prior to the fire where new weed infestations are likely to occur.
  - Private land area is approximately 3,500 acres.
  - Private land infested is approximately 1,000 acres.
  - Miles of road is approximately 60 miles.
- Identify and monitor severe ground disturbance due to fire suppression activities, such as dozer lines, hand lines, safety zones, staging areas, heliports, etc.
  - Dozed lines - 50 miles/1,212 acres
  - Hand lines - 2 miles/48.48 acres
  - Helispots/Safety Zones - 25 acres private and 100 acres national forest



- Fire camp – 18 acres private
  - Flume Trail - 1 mile/24.24 acres
  - Roads - 60 miles/1,454.4 acres
3. Identify and monitor private and county lands that had weed populations prior to the fire to detect density and spatial growth of populations.
  4. Monitor areas for three to five years for presence and persistence of invasive species and treat as required.



*Noxious weeds growing in the burn area*

## WILDLIFE

### PRE-FIRE

#### ***Vegetation Structure***

For wildlife species, the vegetation structure, both vertically and horizontally provides resources such as food, shelter, water and security.

Prior to the fire, much of the area consisted of dense ponderosa pine stands with lesser amounts of hardwoods and meadows. The extent and density of pine trees was much greater than that which existed historically in the area; hardwoods and meadows were at much lower amounts than the historic norm. The pine also tended to be smaller than under historic conditions, a result of overcrowding due in large part by years of wildfire suppression and also from timber management practices dating back 60 years or more. These vegetative conditions had a significant effect on wildlife habitat in the area.



*Elk*

Pre-fire, various seral stages were present such as openings, seedling/sapling stands, sapling/pole stands dense hiding/thermal cover stands and late-successional habitat that would create a mosaic of forested stands, meadows and hardwoods. See Table 1 for pre-fire ponderosa pine forest structure.

#### ***Snags, Down Wood and Water***

Snags are dead trees and are used by 23 wildlife species in the Black Hills. Their effectiveness to provide habitat may be reduced by the surrounding habitat. Many cavity excavators require broken topped snags because it is easier to excavate partially decayed trees. Some cavity excavators require large newly created snags due to the size of the cavity needed for nesting. Some excavators and secondary cavity nesters prefer clumps of snags to individual snags, so spatial arrangement of snags along with arrangement of foraging substrates (other dead material) is important to the usefulness to wildlife. Some species such as bats and some birds require snags that have bark somewhat intact to make them useful for nesting and roosting habitat.

Recent surveys on the Black Hills National Forest generally indicate a lack of snags across the landscape to provide optimum habitat for certain wildlife species. This condition has been changing in recent years due to insect infestations and wildfires. Before the fire, the Battle Creek area did not have many snags of the size and distribution desirable for some species.

Dead wood on the ground is important habitat for many birds, small mammals, insects, and even large mammals. Large dead logs provide food, cover and shelter for small mammals. Dead woody debris also is habitat for amphibians, ants and invertebrates along with fungi. Dead wood associated with grass/forbs is used as cover for natal areas by big game and cover for small game. Before the fire, large down woody debris probably ranged from 2 to 5 tons per acre over much of the fire area, and up to 10 tons per acre in thinned pole sized stands.

Water is a limiting factor affecting the distribution of wildlife within the burn area. The underlying limestone soils and bedrock are very absorbent thus little overland flow occurs. There are a few intermittent streams, such as Foster Gulch, Battle Creek, and Teepee Creek. Most of these drainages are dry by the late summer especially during a drought.

Natural water sources had been augmented by construction of water catchments for wildlife use, referred to as “guzzlers”. Nine guzzlers had been constructed within the burn area.

### ***Big Game Cover, Forage and Security***

There are two types of cover used by big game wildlife; hiding cover, which is cover that will hide 90 percent of an adult deer or elk from view of a human at a distance of 200 feet or less, and thermal cover, which provides escape from temperature extremes. Optimally, thermal cover stands are greater than 30 acres in size and have a canopy cover of greater than 70 percent.

There are currently 3,642 National Forest acres within the Battle Creek Fire area with a big game winter range emphasis. This Management Area (5.4) includes an objective of providing big game thermal cover on 20 percent of the forested area. Prior to the fire, there were approximately 1482 acres of thermal cover or 16 percent of the forested portion of the management area. Thermal cover is more important in the Black Hills to help reduce heat stress on big game in the summer but does provide areas where snow depths, cold temperature, and winter winds are lower.

Due to recent harvesting activities, forage was increasing in the under-story of forested communities. Meadows and other grasslands were being affected by pine regeneration, which was decreasing the amount of forage in those areas. Post harvest activities were scheduled to remove this regeneration prior to the fire.

Roads and trails used by motorized vehicles provide access into and throughout the burned area. Prior to the fire, gates and/or earthen barriers had been used to limit motorized access into some areas in order to provide security of big game and other species, in addition to other purposes. Travel management plans as part of vegetative treatment projects were to be implemented post harvest activities.

### ***Other Wildlife Species***

There was one active or historic goshawk nest stands within the fire perimeter. In addition, there may have been two additional goshawk territories within the fire area based on territory size of this species.

Eight species of bats that require caves or deep mine adits for part of their life cycle are found in the Black Hills. Caves and mines in the Black Hills that are suitable bat habitat are rare. Caves are usually indicative of a karst landscape, which is found in the eastern portion of the fire perimeter. Although the geology of the area is conducive for caves and mines, there has been no survey of National Forest lands for potential bat habitat within the Battle Creek fire perimeter. Since the Sitting Bull Cave and the Rushmore Cave are adjacent to the fire area, it is possible that caves/mines will be located later on. Based on the report Land Snail Survey of the Black Hills National Forest, South Dakota and Wyoming (Frest and Johannes Final Report August 7, 2002), there is one survey location in the Battle Creek Fire. However, no sensitive snails were found at this location. There have not been any other snail surveys completed on National Forest land. Habitat (limestone outcrops) does exist in the fire area.

There are two sensitive butterfly species that inhabit the Black Hills area. These two species are the tawny crescent and the regal fritillary butterflies. The tawny crescent butterfly, which has been found adjacent to the fire area, is primarily associated riparian areas, and mesic sites. Regal fritillary butterflies, which have been found adjacent to the burn, are associated with open prairie habitats. These species lay their eggs on vegetation. The tawny crescent prefers asters and the regal fritillary prefers to lay eggs near violets. Prior to the fire, a monitoring point was established during the summer of 2002, near Jackson Springs. None of these species were identified at the time of this survey.

In addition to the above mentioned species, there are several species of reptiles and amphibians, which occur in the Black Hills. Reptiles include several species of snakes, which use rocks, logs, burrows and vegetation for cover. They feed on insects and small mammals. Amphibians are generally associated with aquatic or riparian habitats, which are very limited in the burn area.



## POST-FIRE

### *General Effects*

Once the fire passed, many of these animals moved back into the burned areas. Deer, elk, turkeys and other birds that returned to find much of their home ranges burned over likely moved on in search of food, water and cover outside the burned areas, big game species having home range territories that lie within and outside of the fire line continue to travel in and out of the burned areas depending on their needs.

Small burrowing mammals likely retreated to underground dens and tunnels where many survived. During field reconnaissance of the fire area, several squirrels were seen restocking their winter caches and foraging on cones, still attached to the tops of burnt and scorched trees. A few voles or mice were seen outside their tunnels indicating at least some survival of these species.

Birds likely flew outside burned areas to escape the heat and smoke associated with this wildfire. Given the time of year, it is believed that most birds had fledged their young and many may have begun to migrate to wintering territories. Songbirds seemed to be concentrated in the low intensity burned areas and in areas with available water.

As the Battle Creek Fire area recovers from the fire, species, habitats and wildlife use patterns will change substantially. In general, there will be a shift from forest dwelling species and use to early succession, and edge dependent species and wildlife use patterns.

The fire has caused an abundance of new snags within the fire perimeter. Many of the existing snags were consumed by the fire and will not be available to secondary cavity nesting birds this spring. The increase in snag densities will directly benefit not only primary cavity nesting species, but will also benefit other insect eating birds, due to the increase of beetles and other insect species that utilize burnt and decaying wood. Nesting habitat for ground and shrub-nesting birds has been greatly reduced for at least a one-year period. Secondary cavity nesters will begin using the area after the second year.



Species that will inhabit the Battle Creek Fire area in the coming years will include; sparrows, mountain bluebird, American kestrel, Lewis' woodpecker, red-headed woodpecker, northern flicker, white-tailed deer, mule deer, elk, pronghorn, ruffed grouse, sharp-tailed grouse, and rodents, such as mice, gophers and wood rats.

The fire consumed deer and elk parturition habitat. The loss of this habitat will likely increase predation of deer fawns and elk calves in the spring of 2003. As grasses, forbs, shrubs and hardwood trees regenerate and fire killed trees fall, there will likely be an increase in the quantity and quality of this habitat within 3 to 5 years.

Where the Battle Creek Fire burned as a mosaic, prime brood rearing habitat for Merriam's turkeys was created. Merriam's wild turkeys prefer small grassy openings with abundant downed wood and adjacent cover to rear broods. Roosting habitat for the turkeys has been reduced in the short term.

Elk populations will likely increase in the area, as they did in the Galena and Cicero Peak fire areas. These increases, primarily due to the increased forage availability, may be tempered by increased access and decrease in available cover. Private lands within and around the fire area will likely experience an increased use by animals seeking cover and forage until these habitats become available within the burned area. Initially the private lands will experience an increase in animals seeking forage in the winter of 2002 and possibly 2003. Future impacts to private lands will depend on the population densities, which in turn are dependant upon availability of forage, water and security within the burned area. Big game population densities will also be dependant upon harvest levels that are set by the South Dakota Game, Fish and Parks Department.

## **Vegetation Structure**

Ponderosa pine areas killed by fire or scorch will become structural stage 1 (grass/forbs seral stage) and will remain in this structure for at least 20 years. Oak and aspen clones that were killed by fire or scorch will most likely re-sprout next spring (depending on moisture availability) and expand in size but will revert to earlier seral stages over the landscape. Some root sprouting may occur. Meadows and grasslands will increase in size and return to pre-fire conditions (grass/shrub) in three years.

In areas of the fire where the mixed severity fire (moderate to low intensity burn), most under story structure was removed, thus creating more open park-like conifer stands. In some stands, torching of small groups of trees, creating a mosaic of stand structure, created small openings. These areas now have a more open crown canopy that will provide sunlight to the forest floor.

Shrubs are an important under story component for wildlife in forested landscapes. They provide browse for deer, hiding cover for nesting turkeys, elk calves and deer fawns, berries and nest sites for songbirds, and dens sites for small mammals. Common shrub species in the Battle Creek fire area are snowberry, juniper, buffalo berry, raspberry, currant, chokecherry, and serviceberry. Many of these species are early seral species that were suppressed by pine over-story prior to the fire. Based on monitoring of shrub regeneration in the Cicero Peak and Shirttail burn areas, the following species are expected to increase: raspberry, chokecherry, wild rose, skunk brush, snowberry, gooseberry, currant, buffalo berry, serviceberry, and kinnikinnick. These species are expected to re-sprout within 1-2 years. They will persist for many years until sapling ponderosa pine begin to compete for water, sunlight, and nutrients.

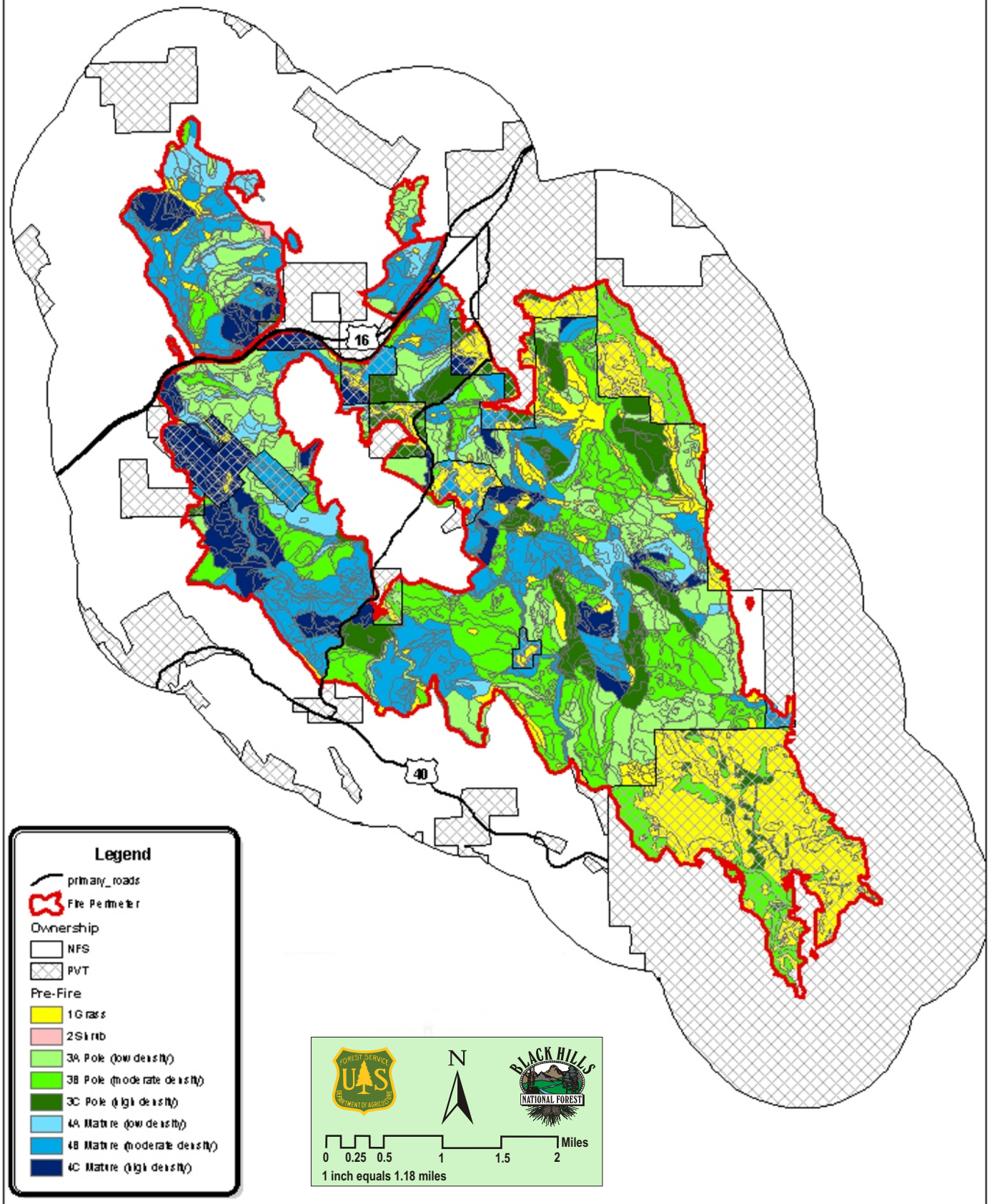
In addition to shrubs, a flush of grasses and forbs will begin to grow as soon as adequate moisture is available. In the Cicero Peak and Shirttail burn areas, from 53 to 90 species of grasses and forbs were identified within 2 years after the fires. These species provide forage and seed for a wide variety of mammals and birds. Noxious weeds are also expected to invade the burn from the existing seed bank or from adjacent infestations.

This change in stand structure and under story structure will benefit the insect gleaners, browsers, grazers and seed foraging wildlife but will reduce the habitat for wildlife that require closed canopy conifer stands and dense under story that provides security and rearing of young.



*Turkey in the Battle Creek burned area*

# Wildlife Structural Stages (Pre-Fire)





# Wildlife Structural Stages (Post Fire)

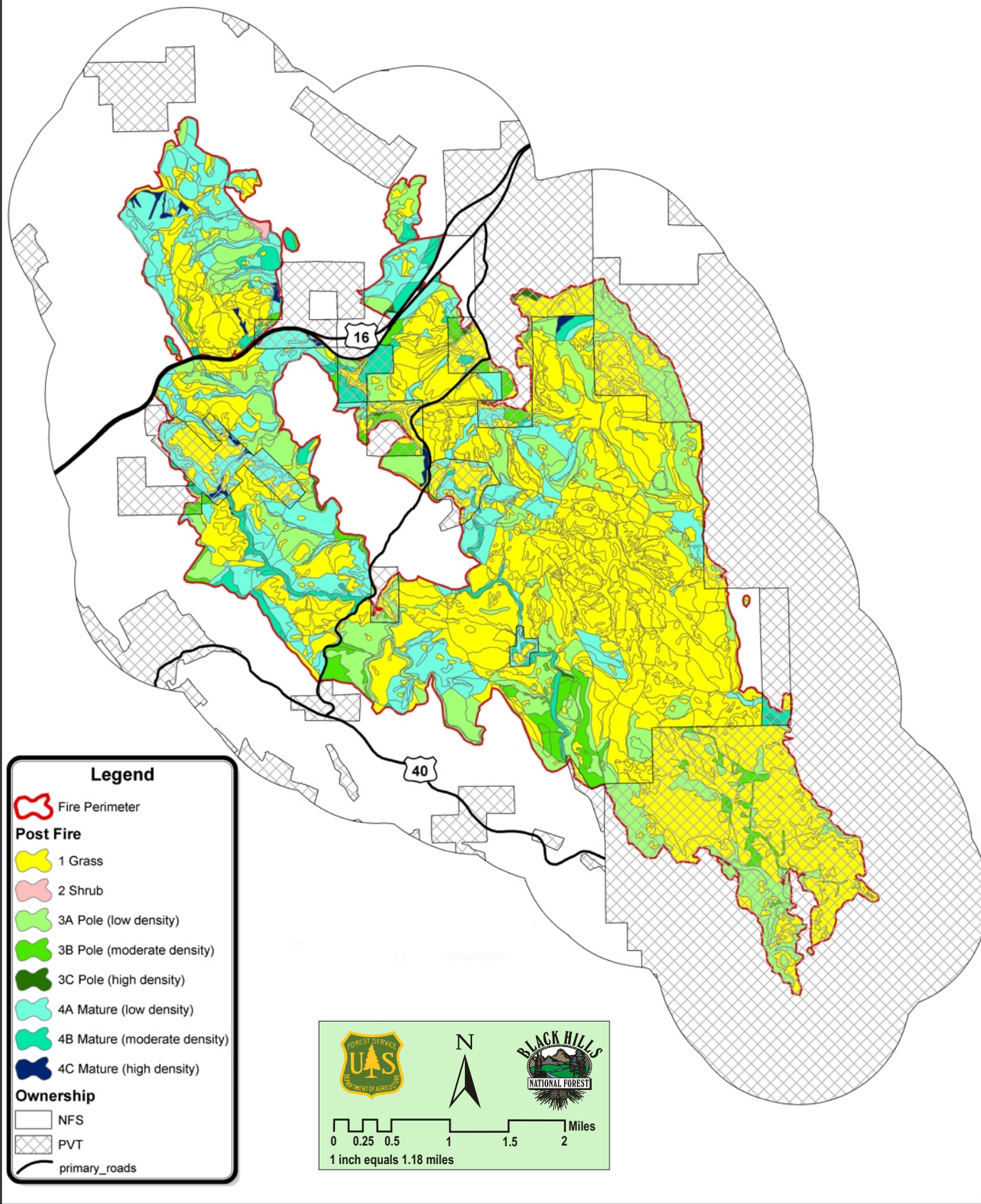


Table 1. Pre-Fire and Post-Fire Structural Stage Estimates based on fire intensity Estimate from Land Sat data.

Battle Creek Fire Cover Types	Pre-Fire Structural Stage <sup>1</sup>		Post-Fire Structural Stage <sup>2</sup>	
	Acres	Percent	Acres	Percent
Grasslands	896	10%	896	10%
Scrublands	13	0%	13	0%
Aspen		0%		0%
Regeneration		0%	50	1%
Pole – low density	47	1%	12	0%
Pole- high density	12	0%	11	0%
Mature – low density	78	1%	85	1%
Mature – moderate density	25	0%	18	0%
Mature – high density	14	0%	0	0%
Bur Oak		0%		0%
Regeneration		0%	128	1%
Pole – low density	178	2%	173	2%
Pole – moderate density	129	1%	81	1%
Mature – low density	94	1%	163	2%
Mature – moderate density	144	2%	0	0%
Riparian Mixed Species		0%		0%
Wet meadow	53	1%	72	1%
Pole – low density	96	1%	73	1%
Mature – low density	45	0%	78	1%
Mature – moderate density	143	2%	115	1%
Mature – High density	6	0%	5	0%
Ponderosa Pine		0%		0%
regeneration	105	1%	4164	45%
pole- low density	1618	18%	1209	13%
pole – moderate density	1650	18%	182	2%
pole – high density	672	7%	10	0%
mature – low density	460	5%	1446	16%
mature – moderate density	1882	21%	143	2%
mature – high density	810	9%	43	0%

<sup>1</sup>Assumptions made to determine prefire structural stage: All stands that were proposed treated in the Beagle, Hollow and Bitter EA/DN are post treatment structural stages prior to burn.

<sup>2</sup>Assumptions made to determine post fire structural stage. High intensity areas decreased to regeneration stage. For moderate and low intensity area: >30 % mortality decrease in stand density and >80% decreased to regeneration stage



### ***Big Game Cover, Forage and Security***

Both hiding and thermal cover were reduced as the result of the Battle Creek Fire.

Approximately 79 percent of the burn area experienced fire intensities (high or moderate intensities) that were enough to kill a large amount of the vegetation providing one or both types of cover. Approximately 21 percent of the area within the fire perimeter burned with low intensity fires or no fire at all. These areas are distributed throughout the fire area. Within the low intensity burn areas; there are some remaining stands with enough standing vegetation to provide limited hiding or thermal cover. As a result of the fire, all of the thermal and hiding cover was lost mostly in 5.4 Management Area within the Battle Creek Fire. Thermal cover is more important in the Black Hills to help reduce heat stress on big game in the summer, but does provide areas where snow depths, cold temperature, and winter winds are lower which helps thermal regulation of big game during climate extremes.

The Battle Creek Fire consumed a majority of the forage used by big game animals throughout the fire area. Grasses as well as forbs and woody plants were consumed on approximately 75 percent of the area. Some of the more mesic sites, such as riparian areas and aspen stands and large meadows throughout the burned area maintained some residual forage. Depending on the moisture received in the next two years, there may be a slow response of grasses, forbs and shrubs to regenerate the high and moderate intensity burned areas.

Management Area 5.4 emphasizes providing adequate forage and cover for over wintering big game populations. Deer will be less likely to move from their home range due to the fire and tend to utilize shrub and hardwood species for cover. Elk will move in and out of the fire area but population numbers will increase due to the increase in forage caused by the burn.

Road/trail yearlong and seasonal closures are no longer effective due to the fire. Screening cover adjacent to roads is no longer providing escape cover for deer and elk in the area as the fire has consumed much of that vegetation. Since the fire, the potential for big game disturbance from motorized vehicles increases due to lack of cover and the number of roads open to motorized use. During hard winters, when summer fat reserves are already stressed, the added expenditure of energy to escape from disturbance has been shown to be the key variable in winter mortality rates in big game.

A portion of the Battle Creek fire was in the South Dakota State Fish and Game Department's hunting unit 9. Unit 9 was created by the department to help alleviate depredation problems on adjacent private lands from big game but with special emphasis on elk populations. The fire has now created more forage for big game, which will ultimately increase elk populations in the future. Immediate effects of the burn (loss of forage/cover), may cause more problems on adjacent lands this fall such as depredation of hay meadows. Long term effects could be alleviated by harvest regulations.

### ***Snags, Down Wood and Water***

The Battle Creek fire created numerous snags (dead trees). It is difficult to overestimate the importance of large diameter trees, snags, and dead, downed wood to many species of wildlife in the Black Hills. Fire and snags have a complex relationship, where fire converts live trees to snags, but they also burn into the already decayed snags and cause them to fall. Fires may “case harden” trees killed by fire causing the outer wood to decay slower thus also reduces the availability of these snags for nest excavation but slows the rate of decay after they fall to the ground. Fire may facilitate decay of surviving trees by providing an entry point for insect and diseases that cause decay. It is also difficult to determine the longevity of fire-injured trees to provide nesting habitat (cavities) before they fall. For trees that experienced under burned and moderate crown scorch, they may remain alive to two years but eventually succumb to decay processes. Longevity for ponderosa pine snags is positively related to tree age and size at death.

Fire both destroys and creates woody debris. However, most large downed logs are not abundant immediately post-fire. This process takes up to 20 years when the trees killed by the fire eventually fall. Downed wood created by fire decays more slowly due to case hardening from the fire. During field reconnaissance, very little downed wood was observed that survived the fire. Most stumps are now burned out holes. Species that had previously used down wood and vegetation are now exposed to predators. These species use of the area will decline in the short term but will return over time as snags fall to the forest floor.

The fire did not affect three of the guzzlers, two were damaged, and the remaining four were destroyed or damaged beyond repair.

### ***Other Species***

The only known active goshawk nest stand was destroyed by the fire, but some of the area around the nest stand was only partially burned by the fire.

Goshawks are expected to continue to use this territory but find another nesting stand. In addition, there may have been two additional goshawk territories

affected by the fire based on territory size of this species. Since the nest locations for these territories had not been determined pre-fire, it is difficult to assess the effects of the fire.



*Guzzler burned in the Battle Creek Fire*



*Before and after shots of a goshawk nesting area*

Caves and karst landscapes are especially vulnerable to changes that occur above this formation. The integrity of any karst system is dependent upon the relationships between water, land, vegetation and soils. Any disturbance in the hydrologic system will threaten the karst and those caves that have a continuing relationship to the water levels or water quality. Changes in soil cover, salutation of waterways, changes in water flow, and changes in vegetation cover can have major impacts. The Battle Creek Fire is a disturbance in the karst landscape and may have impacts to caves that provide habitat for bats, recreational value and cultural value.

It is possible that caves/mines will be located later on that will need protection and monitoring. The Battle Creek fire can potentially impact the use of caves for bat populations below the fire such as Rushmore Cave by increasing water levels and moisture regimes that could cause changes in maternity and hibernacula use. However, Jewel Cave has yet to notice any changes in the cave's microclimate of the Jasper Fire.

Sensitive snail species located by Frest and Johannes (2002) were not affected by the fire. Habitat (limestone outcrops) does exist in the fire area. Most of these areas, especially western and north facing slopes were only slightly impacted by the fire (underburn).

The Battle Creek Fire burned to a lesser extent in riparian areas, and meadows. The fire was likely responsible for the destruction of sensitive butterfly species egg masses located within the burn area. The Battle Creek Fire, however, will likely increase the vegetative diversity in the area, thus increasing the potential habitat for each of these butterfly species, especially the Regal Fritillary.

While some reptiles may have escaped the fire in underground burrows and rock crevices, others may have perished as down logs and snags burned. In high and moderately burned areas of the fire little or no cover remains for these species making them susceptible to predation by raptors. Additionally most of their normal prey base has been lost. Populations of reptiles are likely to decline for a couple of years until vegetation and down wood accumulate again. Re-colonization will likely occur from adjacent unburned or lightly burned areas.

Amphibians are generally associated with aquatic or riparian habitats, which are very limited in the burn area. Most riparian and aquatic areas were lightly burned or were not affected directly

by the fire. However, loss of vegetation above these habitats may cause degradation of water quality and water quantity short term. Since amphibians are impacted by changes in water pH and more importantly loss of moist wet sites caused by loss of over story vegetation, the fire will have direct impact to amphibians that are utilizing these areas. In addition, rehabilitation efforts, salvage recovery efforts and other management activities that cause soil loss and erosion would continue to affect these habitats for at least 5 years. High precipitation events would likely scour these areas and add ash and debris to the streams and low-lying water catchments. However, as with most burn areas, the lack of ponderosa pine cover will likely expand the hardwoods along these riparian habitats and increased water flow resulting from the loss of trees. Additional springs may appear.

## **RECOMMENDATIONS**

- Do not remove any live trees (>33% live canopy) within the moderate and high intensity burn areas including the timber sale areas unless stand conditions warrant management (e.g. thinning). Whenever possible, negotiate to substitute standing dead for live volume.
- Do not vegetatively treat Management Area 3.7 (Late Successional Landscapes).
- In or adjacent to all salvage areas, leave some of the largest diameter dead trees for snags (<14" DBH and <10' in height). Snags of various sizes include these large snags should be left in clumps of 5-10 acres and should be spatially dispersed across the landscape.
- Leave salvage logging slash on-site to provide ground cover small mammals, provide protection for browse species and where it will prevent soil movement.
- Actively work with adjacent landowners, SD Game Fish and Parks Department and other organizations to reduce depredation problems on private lands due to big game.
- Maintain green tree cover areas within management area 5.4 and consider treating adjacent stands to promote development of thermal cover.
- Discourage livestock grazing and wild ungulate grazing in hardwood stands that experienced moderate to high fire intensity during the next 5 years to allow regeneration of these stands.
- Defer livestock grazing in high and moderate intensity burn areas, especially in Management Areas 5.4 and 3.7, until vegetation/ground cover is determined through

monitoring data to be adequate to provide forage for big game and livestock use concurrently.

- Review goshawk structural stages in goshawk Post Fledgling Areas prior to harvesting of green trees. Adjust silvicultural prescriptions to meet the Forest Plan standards and guidelines for Goshawk management.
- Do not salvage log around openings of caves and mines following Forest Plan standards and guidelines.
- Implement the existing travel management plans for the Beagle, Hollow and Bitter Project areas. Maintain administrative access where needed for fire protection.
- Consider area closures (seasonal or yearlong) for motorized vehicles with designated open roads, especially in Management Areas 5.4 and 3.7.
- Remove hazard trees only along roads that will be maintained for access (administrative and public).
- Repair or replace water developments such as wildlife guzzlers, spring development and water catchments. In stock tanks and guzzlers, provide wildlife escape ramps to prevent accidental drowning of wildlife species.

## OPPORTUNITIES

- Consider use of prescribed fire for maintenance of early seral stage areas in long-term project design.
- If planting ponderosa pine, consider interspersing of cover and forage areas for big game.
- In areas of bare mineral soil, consider lightly seeding in fall of 2002 with a mix of winter wheat, oats, and triticale.
- Consider working with SD Game Fish and Parks Department and other organizations to provide information to adjacent landowners that will prevent depredation problems.
- Consider revising allotment management plans along with re-aligning livestock pastures to provide for adequate forage for both livestock and wildlife species. Incorporate direction for fires and drought conditions within management plan. Avoid riparian



areas, which may develop from increased water flow. When replacing enclosures fences around riparian areas, consider the likely expansion of the area due to increased water flow. Fence new spring areas from livestock to protect spring source.

- Consider surveying the burn area for additional cave resources (bat habitat).
- Consider providing a recreational area specifically designed for 4x4-motorized vehicles that would protect sensitive areas while providing an exceptional recreational experience of this type near Rapid City. Work with 4X4 driving groups to help in the design, management and prevention of overuse of the area.
- Consider using snag falling to close roads that have been determined to cause resource damage.
- Consider closing the road in lower portion of Teepee Gulch (FSR 366) to motorized travel to protect riparian and stream habitat from soil erosion that has decrease water quality. Work with four-wheeled drive groups to provide another area for 4X4 use that will not impact sensitive areas. Improve and gravel the upper portion of road in Teepee gulch to provide safe access to private landowners and protect waterways from soil sedimentation due to road drainage problems.
- Consider a Travel Area Closure for Management Area 3.7 (Battle Creek and Bobtail Gulch), Foster Gulch and Teepee Gulch Area, where streams are severely impacted by poor location of roads (in the stream) and recreational use of those roads.

## **MONITORING AND RESEARCH**

- Study and Monitor the effects of motorized travel on roads on big game populations on the forest, especially in the Battle Creek fire area . The study should incorporate other burn areas and other studies of big game in the Black Hills. Study would help with future Forest Plan management decisions and post fire recomendations regarding travel management and road use effects to big game.
- Monitor response of grasses, shrubs and hardwoods using various techniques (e.g. robell pole method) to provide empirical data of post fire response of these species in the Black Hills. Incorporate data into allotment management plans and annual operating plans for the Battle Creek fire area.
- Monitor fall rates of fire-caused snags.
- Monitor post-fire bird diversity in various burn intensity areas.

- Monitor use of known springs and riparian areas by amphibians and reptiles.
- Monitor new springs and seeps for colonization by snails, amphibians and reptiles.
- Monitor use of fire-caused snags by forest bats, woodpeckers, and other snag dependent species.
- Monitor small mammal response to fire conditions and changes in downed wood and structural stages.

## **HERITAGE RESOURCES**

### **Pre-fire Conditions**

Sites represented in the Battle Creek Fire area are variations of the historic themes in the Black Hills Region, including railroad beds, stage routes, mining, logging, camps, and many examples of Civilian Conservation Corps works. One of the most significant sites is the Rockerville flume, located at the northern boundary of the fire. The flume was constructed in 1880 to facilitate gold mining in Rockerville Gulch. The old timbers and rock retaining walls used by the miners can be seen along the trail. Currently used as a recreational hiking trail, it is an interesting trail because it is nearly level and passes through two very narrow tunnels carved out by the flume makers more than 100 years ago.

In total, three eligible prehistoric sites, one unevaluated historic site, and one eligible historic property are located within the Battle Creek fire boundary. In addition, 25 historic properties and six prehistoric properties located within the fire perimeter have been recorded and evaluated as not eligible for nomination to the National Register of Historic Places.

File searches conducted for cultural resources revealed that 73 percent of the area within the Area of Potential Effect (APE) for the Battle Creek Fire had been intensively surveyed. Approximately 1,345 acres were surveyed during suppression reconnaissance. This leaves approximately 1,500 acres of national forest lands to be surveyed.

### **Post-fire Conditions**

Each of the known eligible or unevaluated properties was inspected. One historic site, (Rockerville Flume, 39PN0377) was impacted through construction of fire line by bulldozers. The impact was to a portion of the flume bed and a ditch channel. Hand and mechanical rehabilitation of the fire line was recommended as a suppression rehab task, and is being carried out under the supervision of the Resource Advisor and District Archeologist.

A total of eight sites were exposed to high levels of fire intensity. Historic properties containing wood features were severely impacted. Open surface scatters of lithic material were also altered in these high fire intensity areas. A total of 16 sites were exposed to moderate levels of fire intensity, while seven sites were exposed to low levels of fire intensity. The Rockerville flume received varying degrees of fire intensity along approximately four miles that were within the fire perimeter. The fire did not impact three previously recorded properties, located in unburned areas.

Currently no Traditional Cultural Properties (TCPs) have been formally identified within the Battle Creek Fire perimeter. An area located in the northern portion of the fire area, reportedly contained locations of spiritual use. Prayer bundles and tobacco ties were noted. The fire impacted two of these locations; however, none were damaged by suppression activities. The sites represent small, probably family oriented use, and the area should be noted for such use, during any current and future activities.

Three new heritage resource properties were recorded through an inventory of suppression activities. All three are historic. None of these sites required any rehabilitation efforts.



*Damage in the burned area*

## Recommendations

- The Forest would recommend to the South Dakota State Historic Preservation Office (SD-SHPO) that only one of these newly discovered sites exhibit high potential for research and public benefit. There is a potential for additional significant unrecorded sites to be located within the Battle Creek Fire area. These sites will be evaluated and consulted upon in the Suppression Rehabilitation Heritage Resource Report (FSID 2002020300107).
- Eligible properties should be managed for research and long-term public benefit. Benefits could include on-site field schools such as Passport In Time projects or off-site programs and interpretive products.
- Sites located during surveys need to be evaluated due to risk of loss from the fire's effects. The need for additional site evaluations and damage assessments may be identified as a result of the file search currently being conducted.

## Monitoring and Evaluation

- Eligible properties at risk due to post-fire erosion should be monitored. Monitoring of a sample of previously determined ineligible sites should be carried out to determine if additional information is available due to fire effects.

- The Battle Creek Fire area could be used as an analysis area for the study of fire effects on heritage resources. Data concerning the effects of fire is a critical element in the development of heritage compliance strategies for prescribed and wild fire events. The mosaic character of the Battle Creek Fire and the presence of a variety of heritage resources would provide a unique opportunity to compare and contrast impacts to a variety of site types by different levels of fire intensity.



## RECREATION

### Pre-fire Conditions

Prior to the Battle Creek Fire, the majority of recreation activities in the burn area were dispersed recreation. These included hiking, dispersed camping, hunting, berry picking, off road motorized travel, and driving for pleasure.

The Flume Trail National Historic Trail is the only designated trail in the burn area. Trail use is by foot only; horses, mountain bikes, and ATVs are prohibited. The trail is extremely popular, particularly with people from Rapid City. The trail was in good condition prior to the fire.

### Post-fire Conditions

As a result of the fire, dispersed recreation activities are currently not allowed due to the safety hazards created by dead and unstable trees within the burned area. Directional and informational signing in the burned areas has been destroyed

The Flume Trail has been damaged as a result of fire suppression efforts. Two segments of the trail have had ground disturbance to the point of the trail surface being removed. An estimated 100 trees along the burned area of the trail have been destroyed or damaged. The trail was closed following the fire. Rehabilitation work has started on the trail to repair the surface and drainage back to standard. Additional work will be need beyond the suppression rehab efforts.



*Portion of the Flume Trail damaged during the fire*

### Recommendations

1. The priority is the reconstruction and reshaping of the Flume Trail (currently in progress) to allow the public to use the trail prior to the winter months. Directional signing for the trail should be ordered immediately to be in place prior to the trail reopening, expected to occur in November 2002.

2. Remove an estimated 100 hazard trees within the trail corridor in concurrence with the Flume Trail reconstruction.
3. Informational/interpretative signing does not need to be in place prior to reopening of the trail. Ordering of the signs can be accomplished during the winter and available to install in May 2003.
4. Once hazard trees are removed from the main access routes into the burn area, the public can be allowed access for dispersed recreation.

### **Evaluation And Monitoring**

1. On an annual basis, prior to summer recreation activities, the district trail crew should determine the status of the Flume Trail for the safety and resource problems.
2. The public's enjoyment of the dispersed recreation activities within the burn area will be evaluated through either direct contact with the users and/or through contacts with the districts frontliners and recreation staff.

## **VISUALS**

### **Pre-fire Condition**

The Battle Creek Fire burned into the viewshed of US Highway 16, State Highway 40, County Roads: 330 (South Rockerville Rd), 235 (Neck Yoke Rd), 233 (Silver Mt. Rd), and 228 (Sheridan Lake Road). The fire burned near the communities of Harney, Hayward, Keystone, and Rockerville, as well as north and south into the forest. Meadows and forested lands burned in a combination of low, medium, and high fire intensities, creating a mosaic pattern across the landscape.

The Valued Landscape Character Unit across this landscape is: Gently Rolling Terrain/Ponderosa Pine/Prairie Grass, which includes ridges and valleys, timberlands and grasslands. The forest appears much denser today than that evident in the photographs taken during the U.S. Military Expedition through the Black Hills in 1874. Few, if any, dead trees are evident on the landscape today, where as, in the photos taken during the Expedition, large portions of the landscape display the effects of insect, disease, or fire activity, in the form of standing dead trees. The landscape evident in those photos is diverse in that there are a variety of tree sizes and densities, natural openings, and the rock formations the Black Hills are noted for, are readily evident. The area, before the fire, is densely covered with a carpet of pine trees. Meadows are small and generally not evident, as pine trees have encroached into them. Few meadow or non-forested areas are evident after leaving the prairie. The vegetative patterns that were once dominant are no longer visually evident. The rock formations, screened by the trees, are hidden as well. Generally the forest on private and national forest lands have been managed in a similar manner so you cannot tell where one starts and the other ends – it is a continuous carpet of vegetation.

The topography south of Highway 16 is in the transition zone between the plains and the foothills of the Harney Mountain Range. Relief is limited, and thus visibility from all roads is generally limited to Foreground (1/4 mile and less) views. The topography north of Highway 16 increases significantly and could be considered the start of the foothills of the Harney Mountain. Range. Silver Mountain is prominent from both east and westbound traffic along Highway 16.

US Highway 16, State Highway 40, Sheridan Lake Rd (County Rd 228) are routes through the national forest with a high level of public concern for scenery (Sensitivity Level 1).

Management activities within four miles of the highway (Foreground & Middleground) blend in with the surrounding landscape so completely that they are not evident along these three routes (they meet a High level of Scenic Integrity).

Other main roads through the area that have a moderate level of public concern for scenery (Sensitivity Level 2) include the Silver Mountain Road (County Road 233), and South Rockerville Road (County Road 330). Management activities within 1/2 mile of these highways (Foreground) blend in with the surrounding landscape so completely that they are not evident along these three routes(they meet a High level of Scenic Integrity) .

Highway 16 is a divided high-speed route that receives more than 4 million vehicles annually (*Regional Office – Rapid City, South Dakota Dept of Transportation*), many of them traveling to and from Mt. Rushmore National Memorial. The topography along Highway 16 is rolling with views into the Foreground and distant views into the Middleground.

Along State Highway 40, through the towns of Harney and Haywood, the road is a low-speed scenic route that winds through the rolling foothills and narrow valleys. The topography is such that there are limited views beyond the Foreground.

Sheridan Lake Road (County Road 228) is a low-speed scenic route that winds through the rolling hills and parallels a portion of Spring Creek. The topography and vegetation limit views to the Immediate Foreground. However there are locations along the route where the North side of Boulder Hill and Silver Mountain are evident.

## **Post-fire Condition**



*Post-fire: Silver Mountain landscape, west side.*

The fire has drastically changed the vegetation across this landscape (see Fire Intensity Map).

		Acres of Fire Intensity		
Scenic Integrity Objective	SIO Total Acres	High	Moderate	Low
High	1360	340	300	720
Moderate	3880	895	1010	1975
Low	3835	1045	963	1827
Totals by Intensity		2280	2273	4522
USFS Lands w/in Fire Area	9,120			
Other Lands w/in Fire Perimeter	3,330			
Total Fire Area	12,450			

Half of the fire area on national forest lands (approximately 4,553 acres) are in the “Moderate” or “High” Fire Intensity classification. Approximately 100% of the vegetation is killed in the High Intensity areas and an estimated 80% in the Moderate Intensity areas.

Those areas with a High and Moderate Scenic Integrity Objective (approximately 5,240 acres) are generally visible from the highways where there are public concerns about the scenic beauty. Approximately half of this area, 2,545 acres, is in a Moderate or High Fire Intensity classification. These areas are generally visible on the upper 1/3 of the foothills. In most cases, there are areas of live vegetation between the viewer on the highway and these severely burned areas. In addition, these burned areas are visible as only a portion of the viewed landform.

The exception to this is Silver Mountain along Highway 16. Approximately 90% of the vegetation across this landform is in the Moderate-High Fire Intensity.

Highway 16, and the other roads traveled by the public, will continue to receive the same level traffic. Severely burned ridge top vegetation throughout the fire area will be visible for short durations along all these main roads of concern. Rock formations along the ridgelines will become more evident as the fire-killed vegetation decays and falls over. A vegetation pattern



is now evolving on the landscape that may be similar in scale to that which is evident in the 1874 Expedition photos.

## **Recommendations**

- Consider trying to maintain portions of the existing pattern that has been created – a transition zone – between the prairie and the forest.
- Minimize visual impacts of roads.
- Consider removing small trees within the immediate foreground, along main travel routes.
- Coordinate management activities with private landowners, utility companies, and others, to limit negative visual effects and create naturally appearing boundaries and vegetative openings – patterns in the landscape. Coordinate efforts to enhance meadow and hardwood restoration efforts.
- Consider an interpretive site near the fire, in a scenic setting, along a major highway to interpret the Battle Creek Fire event and an aspect of the fire ecology.
- The photos on the following page show the existing condition, and a rough estimate of the vegetative pattern that has been created by the fire. Management activities need to consider preserving, and where possible, enhancing, the overall natural appearance on all sides of this mountain. Consider activities that will maintain the natural vegetative pattern, diversity, and seasonal color. Consider avoiding activities that would create unnatural appearing lines on this landscape. Consider activities that would stabilize the soil on steep slopes that could erode and create soil color contrasts, such as along the south slope of the mountain. Consider planting native grasses and wildflowers to compete with the natural regenerating pine in areas where we want to maintain the existing pattern of openings.



*Post-fire: Silver Mountain landscape, east side, viewed from Highway 16.*



*Potential Summer View: Silver Mountain landscape, east side.*



*Potential Winter View: Silver Mountain landscape, east side.*

## Evaluation and Monitoring

The forest should conduct a forest-wide monitoring effort, at 5-year intervals for 10 and possibly 15 years, to determine the effectiveness of management activities on visuals in burn areas:

- To maintain and enhance natural appearing vegetative patterns
- To create natural appearance of managed land boundaries with private land
- To limit creation of soil contrast and erosion control
- To encourage hardwood and meadow restoration in fire areas

## RESOURCES ON PRIVATE LANDS

### Pre-fire Conditions

Pre-fire conditions on private lands were much like those found on national forest land. If forested, the vegetation consisted mostly of ponderosa pine, intermixed with patches of bur oak, quaking aspen and paper birch. If non-forested, the vegetation consisted of various shrubs, grasses and forbs.

Some properties had been actively managed. Stands within the fire consisted of a variation of pre-commercial, post or poles, and commercial size trees.

### Post-fire Conditions

The Battle Creek Fire affected 3,301 acres of private lands. There is no known State land affected. According to county 911 mapping, fifty known structures were in the burn area and possibly 20 more structures were unmapped. Three residences and several outbuildings were burned in the fire. Numerous other residences were threatened by the fire, but not directly affected.

Impacts on private lands will be similar to those on National Forest System lands. These include amount and timing of water flow, sediment loading changes, weed infestations, fence damage, wildlife use patterns, and impacts to stock tanks.

Burn intensity varied from low to high across private properties.

- Low-intensity: many tree crowns are all, or partially, green
- Moderate intensity: many tree crowns are entirely or almost entirely scorched
- High intensity: trees are devoid of needles.

### Recommendations

- It is recommended that trees with 2/3 or more of the crown scorched or devoid of needles be removed as soon as possible due to the chance of infestation by wood borers and/or bark beetles. Wood borers decrease the value of the wood by tunneling through the heartwood of pine. They can also introduce blue stain fungi to trees, causing discoloration and an entrance for other fungi to degrade the wood. Bark beetles also allow blue stain fungi to invade the wood. The populations of these insects have increased in the Black Hills over the past 3-4 years due to storm damage and other fire events.

- According to reports from the Forest Service entomologist, red turpentine beetles, Ips and woodborers were found in the fire area. These attacks were on heavily burned or scorched trees. Due to the late infestation of these insects, larvae are not expected to mature much more this fall unless temperatures remain warm throughout the early fall months. High value landscape pines should be sprayed as a preventative measure against insects.

SD RC&F has cost-share assistance money available through the Bark Beetle Program for removing and disposing of trees infested with mountain pine beetle or Ips, but the beetles must be active in the tree. Details of this program can be obtained through your local SD RC&F office.

- Moderately burned trees with 50% or more green foliage remaining have good chances of surviving fire damage but are highly stressed and may be more susceptible to insect attack next spring. Assistance can be requested from the SD Division of Resource Conservation and Forestry (SD RC&F) to determine which fire-damaged trees should be removed. No cost-share is available for salvaging burned timber.
- Natural regeneration of ponderosa pine is expected in areas of low to moderate burn intensity and in areas near living seed sources. Cost sharing through the SD RC&F may be available in the future, for replanting areas of high intensity burn.
- It is also recommended that where salvage operations are done slash be left in areas with little or no ground cover in order to disperse precipitation and decrease erosion. The State Slash Law (21-10-26) must be followed, which states that “all logging slash must be lopped and scattered so that it will not exceed 18 inches in depth on any part of the logged area... or it must be chipped.”
- Private landowners need to be aware that they may experience depredation problems caused by wildlife. Concerned landowners may contact the South Dakota Department of Game, Fish and Parks for advise and/or technical assistance.
- Landowners should be aware that many private fences were damaged as a result of the fire. Fences adjacent to Forest Service grazing leases should be repaired prior to the 2004 grazing season.
- Soil erosion, sedimentation, and flooding may occur in the area now that much of the vegetation has been removed. Wet areas may also develop in places that were previously dry. this could affect private lands in many ways. the U.S. Natural Resource and conservation Service (NRCS) is available to work with landowners on these issues.

- Landowners should evaluate their property, making their homesites more fire-safe. Specific recommendations can be acquired from the local fire department or the South Dakota Division of Wildland Fire Suppression.
- Landowners should consider overall management of their forest lands. Cost share is available for thinning projects and forest management plans. Contact South Dakota Department of Resource Conservation and Forestry.
- Recommend all South Dakota Best Management Practices (BMPs) be followed during all salvage and/or cleanup operations.

## **Evaluation and Monitoring**

Scorched ponderosa pine that have a good chance of surviving should be monitored through September of 2002 and beginning again in April of 2003 through the summer of 2003 for insect infestation. All beetles will continue to fly throughout the month of September (depending on the weather) and Ips beetles may start flying again in the month of April. Symptoms to look for include sawdust in bark crevices or around the trunk of the tree, coin-sized sap globs (pitch tubes) on the trunk of the tree, BB-size holes (Ips) and 1/4" lip-shaped holes (wood borers). SD RC&F will provide assistance to landowners in determining infestations by request.



*Fire retardant on structure*